

Accelerator Systems Division Highlights Ending September 17, 2004

ASD/LANL: Warm Linac.

ASD/JLAB: Cold Linac

String assembly for H-9 is complete. The string will be turned over for cryomodule assembly when an assembly rail becomes available.

Three cavities have been qualified for the H-10 string and one cavity for the H-11 string.

H-7 and H-8 cryomodule assembly continues on schedule.

Testing of the H-5 cryomodule is proceeding successfully. The two cavities tested at high power have performed at 20 and 30% above specification, respectively.

The H-6 cryomodule was shipped to ORNL.

Repair of the leaking helium vessel in the M-11 cryomodule has begun.

ASD/BNL: Ring

ASAC talks are being prepared for the upcoming review. Four talks will be presented by BNL/SNS staff members (J. Wei, D. Raparia, T. Russo and C. Pearson). Dry run talks (BNL and OR) are scheduled for Tuesday, Sept. 21st.

Magnetic measurements of Chicane #1 are complete and the magnet is being moved into the Injection string in Building 905.

Two 1st article power supplies will be acceptance tested at IE Power next week (900V, 51 & 80V PS). Ken Rust will witness the testing and communicate results/issues by phone with J. Sandberg and/or R. Lambiase.

Pulse Forming Networks (PFN): Applied Power Systems completed testing of PFN unit #12. They will soon have the last four units ready for shipment to Oak Ridge. In recent communications, APS stated that they are waiting for the return of shipping crates from ASD.

RF straight section: the first set of doublet magnets is being assembled to their bases. The second set is in pre-survey.



Magnetic measurement on #1 injection dump septum magnet (with bumps) was presented to AP this week. Another iteration of testing will begin tomorrow.

Charlie Pearson reported that the ground resistance of one of his mineral insulated 36Q85 coils has improved to ~ 50 mega-ohms.

A fifth extraction kicker magnet has been TiN coated.

Test of overall impedance of one complete extraction magnet assembly (coated ferrite magnet in vacuum chamber) with its PFN was completed and results presented to AP. No differences were observed between coated and uncoated kicker magnets. Full power testing is next.

Work is underway to define budgets, plans and BA for FY05.

We await guidance from ASD on the 36Q85 magnet assembly.

The Ring Primary collimator has been shipped from SDMS. ETA at SNS/OR is mid October.



Controls

The controls team developed a number of possible work options for FY '05 in support of various project budget and schedule scenarios.

Once again this week the controls team was involved primarily in supporting operations. Support was also provided for the investigation of the cryogenic system heater incident of the previous week. Use was made of operational time to continue noise measurements in the Front End and the Klystron Gallery.

Installation continued for Klystron Building SCL rows 13-17 and in the HEBT Service Building. We are down to the last half of termination work for both of these SROs. An SRO was submitted to install additional SCL vacuum system RS-485 links. This will reduce the number of gages per link and should improve communications performance (thereby improving PV parameter display update times).

PSSO presented a much reduced list of "Phase 2" backbone fibers to complete the project fiber installation within budget constraints. We expect to request some changes to this list early next week. Meanwhile, racks and fiber termination hardware have been installed in the CLO Central Equipment Room to support the installation of cable tubes.

Based on experience with serial vacuum devices in the SCL, the HEBT/Ring/RTBT vacuum software has been reconfigured in two ways. EPICS record processing is now scheduled using a two-tiered priority system and unnecessary record processing is inhibited (e.g. Ion Pump pressure readings if High Voltage is off). In addition, the

planned single RS-485 "string" has been broken up into several parallel strings, allowing concurrent serial transactions. These changes bring the vacuum serial device responsiveness within desired limits, with only a modest increased hardware cost (< \$1000). All necessary parts have been ordered.

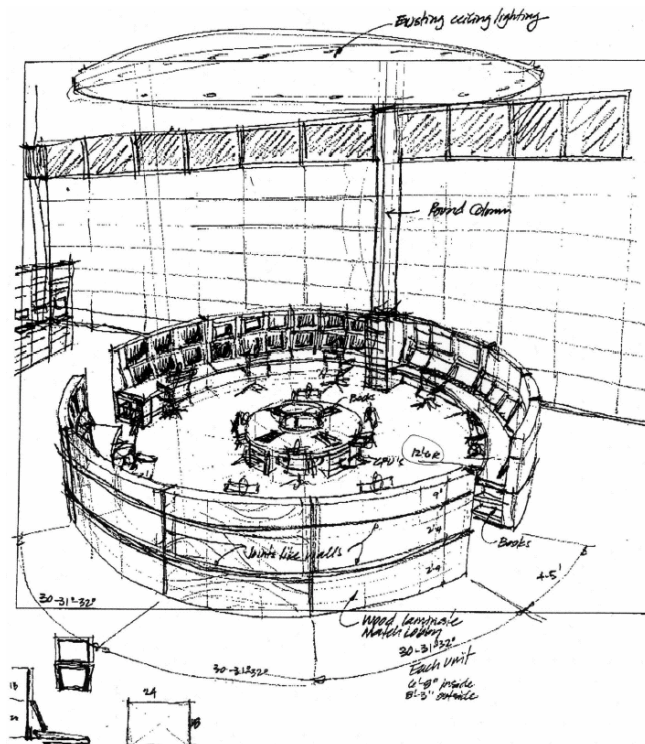
The RF Status screen now includes an indication that the timing pulse for RF power readings is set correctly with respect to the HVCM and LLRF pulses. Work proceeded towards getting the LLRF waveform updates at a reduced rate, but still synchronous with the beam. In preparation for upgrading the MEBT to the common system, tests were performed to verify that the FCM-based system can do resonance error computations the same way as the LBNL box now does.

Test transmitters and cabling were prepared to support the upcoming factory acceptance test of the collimator cooling water skids.

The PSC/PSI cable pull list for the HEBT was completed and a block diagram drawing showing how trigger cables are routed in the RSB was prepared. This was required to assure that the trigger cable data is correctly included in the network cable package.

Sergei Chevtsov gave a demonstration of new archive retrieval tools.

Discussions on the move to the Main Control Room in the CLO intensified this week, detailed changes were proposed and a number of configuration drawings were prepared for discussion. A rendering of one possible configuration is shown below.



Installation

Craft Snapshot 9/14/04

ASD productive craft workers	63.0
Foremen (Pd by 15% OH)	5.0
AMSI management (Pd directly)	3.0
TOTAL AMSI WORKERS	71.0
Less WBS 1.9, 1.2 etc	8.0

Less absent	5.0
TOTAL PD BY ASD/ORNL DB WPs	50.0

Accelerator Physics

Operations

Ran Commissioning Activities in the warm Linac.

- Some beam was transported to the CCL Beam stop by last Thursday September 9th at about 20:00.
- Transmission was improved and a more thorough setup of the MEBT and DTL 1-6 was underway when smoke was detected in the Linac tunnel shielding maze.
- Commissioning was suspended Friday September 10th in the evening when smoke was detected in the Linac tunnel.
- RF processing was resumed Monday September the 13th at 16:00.
- Commissioning resumed Tuesday the 14th at 08:00

Participated in meetings and the final report preparation for the “Technical Response to the Fire Alarm”.

Began preparations for ASAC

ASD Operations developed a plan for integrating Operations in ASD and XFD in light of the new Accelerator Safety Order DOE O 420.2B. A series of meetings took place to obtain XFD buy in for this plan. Specific topics discussed included:

- Conduct of Operations
- Operations Procedures Manual
- Cross-Training of Target Operators on the Accelerator and a schedule with time commitment for the training.
- Control Room layout

Worked with the RF Group on barcoding assets that had not been barcoded or tracked when installed.

Began the process of an ASD Office Assignment Plan for the final move-in at the completion of the CLO

Ion Source

The ion source on the Front-End keeps providing the H⁻ current required for commissioning DTL and CCL1-3 despite (or because) Robert Welton and Martin Stockli being out of the country.

Robert Welton and Martin Stockli attended the “10th International Symposium on the Production and Neutralization of Negative Ions and Beams” in Kiev, Ukraine. Their presentations, “Ion Source Development at the SNS” and “Emittance Analysis and Ghost Signal Busting in Allison Emittance Scanners” were received with high interest. References in several other presentations made it clear that many colleagues start to realize that emittance numbers can be meaningful if correctly evaluated.

Ion source # 3 has been reconditioned and installed on the hot spare stand to measure emittances with 30 and 40 mA.

Survey and Alignment

Last week S&A aligned two additional cryo-modules.

The Design Group requested that we measure the position of the injection and extraction dump flight tube. This task was completed.

As S&A we assisted the Target Group and the general contractor in aligning the target cart diving board. The mercury target is mounted upon this plan and then driven into the core vessel.

On the monolith for the Target Group we started measuring the displacement of the three newly installed core vessel inserts. The measurement is the angular difference of the installed position of the core vessel insert as compared to the ideal measurement taken prior to installation. This angular difference is to be used by the individual instrument groups to mount their various pieces of equipment.

Target engineers for beam line 7 asked for more information concerning the interstitial block cavity dimension and position. This I supplied as requested.

S&A's support of the Magnet Measurement group this week was the fiducialization of two 8Q35 magnets and two 21Q40 rafts. The 21Q40 rafts are needed for installation in the HEBT and the 8Q35's are needed to build the warm sections for installation.

The latest epoch of settlement monitoring in the RTBT was finished last Friday. At the RTBT-Target interface, another 2 mm of settlement was found. This part of the tunnel now lies 6.88 inches below the floor design elevation. The settlement rate has been decreasing since the end of the backfill operation on July 19.

Reduction of the Linac settlement data has been finished. Over the last six months, the Linac tunnel has continued to settle. The average settlement was about 0.8 mm during this interval, but the settlement was not uniform over the length of the tunnel. Additionally, the differential center-vs-side settlement continued. Typically, the floor monuments by the aisle-side wall settled 0.25 mm more than the corresponding monuments at the center of the tunnel floor.

The relatively large magnitude of settlement discovered in the upstream HEBT (typically 1.5 mm over the last 6 months) has caused us to re-think the precision requirements for the upcoming elevation monitoring in the Ring and downstream HEBT. Since similar settlement is expected there, it would be unnecessary to implement a procedure capable of detecting 10-20 microns locally, at the expense of weeks of effort.

Therefore a new procedure has been selected for the Ring-HEBT monitoring, which results in less precision (typically 50 microns locally), but is much faster. The planning and scheduling of this campaign is complete, and it will be performed next week.

Additionally we are in the process of updating our drawings and data base for the RTBT are based upon new information released by BNL.

Completed placement of assigned quads and correctors on HEBT curve. Updated respective databases, generated drawing and reference file, completing data and drawings of all components assigned to HEBT curve.

Mechanical

All water systems seem to be coming under control. Refills of all RCCS systems are > 3 days which is a tremendous improvement. The addition of De-ox bottles and diligent replacement of filters seems to have taken care of the flow meter stoppage problem. We continue to forge ahead in our understanding and operation of these systems.

The RFQ water chiller which formerly was causing problems had been repaired but was checked again by a service agent to verify proper settings.

The Front End System and all DTL tanks seem to be operating well for the commissioning run and the good news is that there isn't much to report.

Magnet Task

We now have mapped 17 – 8Q35's for SRF warm sections. Eight have been chosen for installation. Six have been mounted on rafts. Two rafts have been aligned.

We have two 21Q40/27CD30 assemblies installed in the HEBT. Two more are assembled and being aligned.

We Split the ¼ cell in the beam tunnel, removed the leaking beam tube, installed the spare tube, and re-assembled the magnets. This exercise went quite smoothly. The system is now being pumped down.

We have also assisted with DTL/CCL water systems. We installed a Nitrogen blanket on RCCS4 which has had a big effect on fill rate of this system.

Electrical Group

SCL-ME4 modulator tank was moved into place, and we are now waiting on the completion of the remainder of that section to finish installation. Support for RF operation of SCL-ME2 was provided this week. SCL-ME1 was removed and prepped for a transformer/capacitor modification to retune the resonant circuit. This should allow for more reliable operation and (hopefully) the ability to achieve 60 Hz operation. We attempted to operate CCL-ME4, but it appears as though we have a PPS problem. Other than some concerns related to water leaks from the weather, the remainder of the warm linac HVCMs continue to operate reliably in support of commissioning.

HPRF

RFQ through CCL3 RF Stations are presently supporting beam optimization studies.

CCL4 RF Station: Completed transmitter checkout, working with HVCM crew on klystron diode mode operation.

SCL ME1: MB3 HPRF testing completed. Installing calibrated waveguide couplers in MB4 waveguides.

SCL ME2: Transmitter checkout completed. Brought all 12 klystrons up to 100kW for RF leakage survey. No leakage measured. High power checkout continuing.

SCL ME7: Mounted six klystrons in HV tanks in RFTF for transfer to Gallery. We have several water loads at LANL that must be shipped before gallery waveguide installation can be completed.

RFTF: Cryo-coupler testing: Baked out and mounted next coupler pair, RF processing has begun.

Personnel: Tom Hardek has been brought on board as a senior RF engineer for the Ring RF, MEBT and klystron transmitters. He has immediately taken a significant role in bringing up the SCL transmitters.

LLRF

Operations: We are supporting the warm linac commissioning run and making improvements as necessary to the sequencer and to various system settings. One problem we've had is occasional excessive RF drive from the FCM during closed-loop operation. This leads to an overpower fault on either the transmitter solid-state amplifier or the klystron or both. We discovered the root cause this week and will make adjustments at the next opportunity.

Installation: Installation is complete on SCL ME-1 and ME-2. Testing of the ME-2 klystrons is in progress. Installation is nearly complete on SCL ME-3. The cables have been terminated; loss factor measurements are in progress. The ME-4 LLRF control racks are loaded; cable pulls must be completed before we can go further. We are beginning to load the racks in ME-5.

Production: The final 20 Digital Front End daughter boards are due at the end of September.

FCM Assembly and Testing: We continue to assemble and bench test Field Control Modules at a rate commensurate to our installation schedule.

Bar Coding: We are putting extra effort into bar coding all the LLRF equipment already installed in the klystron gallery.

Procurements: In response to a request from the division office, we have pulled forward two planned FY05 procurements: 805 MHz bandpass filters for the SCL installation and 25,000 ft of Helix cable, enough to finish the SCL. We will submit a requisition next week for a few additional VXI crates.

Ring RF: The most recent shipment of Ring RF components has been delayed until after Oct. 1 due to financial considerations at BNL. Tentative planning calls for Kevin Smith of BNL to visit SNS during the week of Oct. 4. Chip Piller and Tom Hardek plan to visit BNL the week of Oct. 11.

Cryo Group

Beam Diagnostics

BPM:

Nearly all BPMs through the CCL stop have been running reliably. One unit appears to have a bad calibration circuit. This is being checked out. Intra-pulse phase waveforms in the CCL appear to be consistent with initial BSM measurements. The phase slew within the pulse is affected by settings of the upstream RF system. Therefore, it appears that the BPMs are reporting good phase waveforms, but for cleaner phase measurements during a scan, the BPMs have been set to average only the end of the pulse.

Beam energy out of the DTL has been measured manually using time of flight.

BCM:

All BCMs except SCL00 continue to work well and provide good current measurements. All digitizers for the linac BCMs have been ordered...

Wire Scanners

Wire scanner electronics has been installed in the HEBT service building.

D-Box:

Work continues on the emittance scanner. Additional work on the D-box vacuum components will occur during the next convenient maintenance period.

Faraday Cups:

All DTL Faraday cups are working well. Although beam energy out of DTL appears correct, the faraday cup in CCL does not see beam through its degrader. This is still under investigation.

BLM:

All ion chambers and neutron detectors continue to work well.

Misc:

Cables are being terminated in the SCL and HEBT. Subcontractors have been extended for a few more weeks.

Interviews have been completed for the engineering position, but this position has been deferred until FY06. Two presentations for ASAC are being prepared.